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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,562	01/11/2002	Franklin Dean Kalk	064441.0224	9523

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EXAMINER

ROSASCO, STEPHEN D

ART UNIT PAPER NUMBER

1756

DATE MAILED: 02/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/044,562	Applicant(s) KALK, FRANKLIN DEAN	
	Examiner Stephen Rosasco	Art Unit 1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 January 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

Detailed Action

In response to the Amendment of 12/30/03 the examiner repeats the rejections here and makes the action final.

REMARKS – The applicant argues that the cited art fails to teach a method for fabricating a transmission balanced photomask comprising the step of forming a single layer of transmission balancing material over the substrate, the transmission balancing material having an index of refraction greater than the index of refraction of the substrate and being substantially transparent to at least one wavelength.

The applicant discloses that the claimed invention is directed to a problem associated with AAPS masks, which results from diffraction effects in the trench areas. In general terms, as light passes through the trench at a non-normal angle, some of the light will be reflected outside of the trenched area. These diffraction effects cause less light to exit the etched trenches than that exiting the unetched area, resulting in an unwanted transmission imbalance. Such an imbalance decreases the effectiveness of the photomask and detracts from the improvements which motivate the use of AAPS photomasks.

The applicant designates the layer in the trenches as a balancing layer, and states that the prior art does not teach the claimed invention. However, as long as that layer has an index of refraction that is greater than the index of refraction of the substrate then the condition is met to minimize the loss of light. The amendments that were made to the independent claims, that the balancing layer is a single layer and that the substrate is substantially transparent to at least one wavelength, would be considered to be standard design requirements for these phase shift masks. Therefore, the examiner maintains the rejections and makes the action final.

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5 and 11-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Vasudev et al. (5,472,811).

The claimed invention is directed to an alternating aperture phase shift mask and a method of making comprising forming a transmission balancing layer in phase shifting trenches in the substrate, wherein the index of refraction of the material in the trenches is greater than the index of refraction of the substrate.

Claim 2 the transmission balancing layer is SOG.

Claim 7 the transmission balancing layer is planarized using Chemical Mechanical Polishing.

Vasudev et al. teach a phase shifting photomask of wherein the substrate is of quartz; first layer is formed from a material selected from a group consisting of magnesium fluoride, titanium dioxide, zinc oxide, aluminum oxide;

and the second layer is formed from a group consisting of organic films.

And wherein said first layer has a refractive index of greater than 2.0 and said second layer has a refractive index of less than 1.5.

Claims 1-7 and 10-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Scott et al. (5,935,733).

Scott et al. teach a phase shift mask structure comprising: a planar first layer of material that is transmissive;

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a plurality of trenches in said first layer; and
phase shifting material having different refractive properties formed within said plurality of trenches.

Scott et al. also teach wherein said first layer comprises silicon, quartz, calcium fluoride, magnesium fluoride or indium tin oxide. And planarizing the surface with Chemical Mechanical Polishing.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Vasudev et al. (5,472,811) or Scott et al. (5,935,733).

The claimed invention is directed to an alternating aperture phase shift mask and a method of making comprising forming a transmission balancing layer in phase shifting trenches in the substrate, wherein the index of refraction of the material in the trenches is greater than the index of refraction of the substrate.

And the use of an antireflective layer and/or a pellicle on the surface.

The teachings of Vasudev et al. or Scott et al. differ from those of the applicant in that the applicant teaches an antireflective layer and/or a pellicle on the surface. However, in the prior art of phase shifting masking antireflective layers and pellicles are used extensively on the surface.

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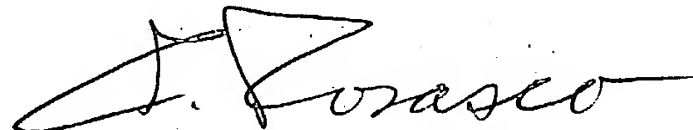
Therefore, it would have been obvious to one having ordinary skill in the art to take the teachings of Vasudev et al. or Scott et al. and combine them with a knowledge of the prior art in order to make the claimed invention because these techniques are well known and can be used independently of the other teachings of the prior art for the beneficial purposes that they are known to be used for.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to S. Rosasco whose telephone number is (703) 308-4402.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661. Fax (703) 872-9310 Before Finals; 872-9311 After Finals.



S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
1/27/04